

**INDIAN INSTITUTE OF TECHNOLOGY
DHARWAD**



॥ सा विद्या या विमुक्तये ॥

भारतीय प्रौद्योगिकी संस्थान धारवाड
Indian Institute of Technology Dharwad

**Department of Computer Science and
Engineering**

Information Brochure

Ph.D. Admissions

Autumn Semester (2020-2021)

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A. SCHEDULE OF Ph.D. ADMISSION

Detailed schedule of admission process will be announced later on the institute website.

Deadline for submission of online application: ~~5th May~~ 21st May 2020, 11:59 pm.

First shortlist of eligible applicants: 28th May 2020 (tentative)

All potential candidates are requested to visit institute website regularly for updated information about the schedule, especially in context on ongoing Coronavirus (COVID-19) related developments. Future updates regarding the admission process will be made available on the institute website under section Academics >> Admissions >> PhD.

B. ELIGIBILITY FOR ADMISSION

B.1 Qualifying Degree

M.Tech. or equivalent degree in Computer Science and Engineering or any related stream.

B.2 Minimum score in the qualifying degree

For General/OBC category candidates and/or for candidates where no concession in academic performance is called for, the eligibility criteria in the qualifying degree (M.Tech./M.E.) is either:

- 1) a minimum of 60% marks (without round off) in aggregate, OR,
- 2) a minimum Cumulative Grade Point Average (CGPA) or Cumulative Performance Index (CPI) of 6.0 on the scale of 0-10; with corresponding proportional requirements when the scales are other than on 0-10, (for example, 4.8 on a scale of 0-8).

For SC/ST category candidates and differently abled candidates (PwD), a relaxation of 5% (or CPI/CGPA of 0.5 on the scale of 0-10) in the qualifying degree is applicable.

B.3 Eligibility of applicants who are in the final phase of getting the qualifying degree

Students who are in the final phase of receiving above mentioned qualifying degree and who are likely to graduate before commencement of Autumn 2020 semester of IIT Dharwad are also eligible to apply. However, if offered, the admission to those candidates would be provisional. To join academic program at IIT Dharwad, such candidates need to furnish necessary documents regarding completion of the degree on the date of joining mentioned in the Section A above. They need to meet the criteria specified in section B.2 above considering updated score in the qualifying degree. In the meanwhile, the aggregate academic performance announced by the respective university till the last date for submission mentioned in section A should be used to determine eligibility for application and same to be reported in the online application.

C. APPLICATION CATEGORIES & FINANCIAL SUPPORT

The Department of Computer Science and Engineering admits Ph.D. candidates under the full time research scholarship or Teaching Assistantship (TA) and part-time externally sponsored research scholars.

C.1 Teaching Assistantship (TA)

Funded by MHRD, the TAs are expected to assist in the academic/administrative work for smooth functioning of the Institute. Students under this category are entitled to the financial support as per the MHRD norms.

1. For students with M.Tech./M.E./M.Sc.(Engg.)/M.Phil. or equivalent degree as the qualifying degree, the assistantship is payable for a maximum duration of 5 years or up to the thesis submission, whichever is earlier. At present, the monthly rate of assistantship is ₹ 31,000 for the first 2 years and enhanced rate of ₹ 35,000/- for the remaining 3 years and HRA as per rules.
2. To get the Teaching Assistantship, the students concerned must assist in teaching, research and/or administrative work as assigned by the respective Academic Unit to the extent of 8 hours of work per week.
3. The continuation of the assistantship will be subject to the satisfactory performance of the duties assigned by the Departments as well as satisfactory academic performance.
4. As per MHRD directives, the employees on the rolls (with or without pay) of any organization are not eligible for admission under this category. Candidates selected in this category have to resign from the current job and submit a relieving letter from their employer before joining the programme.
5. Students getting assistantships from the Institute may join projects sponsored by external agencies and obtain corresponding fellowships in lieu of TA ship.

C.2 Externally sponsored part-time Ph.D. (EX)

The candidates employed in recognized R&D organizations and desirous of pursuing Ph.D. programme while in employment may apply for admission as external candidates. The option of external registration is for applicants who are working in well-equipped scientific institutions, laboratories, R&D establishments and industrial organizations engaged in research based activities. Persons working in colleges/universities are not eligible under this category. After fulfilling the coursework requirement at the Institute, these candidates will be allowed to register for Ph.D. with a Supervisor (internal) from the Institute and a Co-supervisor (external) from their parent organization where they will be doing the research work. The admissions are based on the following norms:

1. The competence of these candidates will be assessed along with the regular candidates.
2. On the day of selection process, the candidate should submit a Sponsorship Certificate (Appendix A) from the organization in which he / she is employed giving an undertaking that the candidate would be released from the normal duties to fulfill the coursework

requirement (and qualifier examination, if applicable). The certificate should also provide details of facilities relevant to the research programme and available to the candidate.

3. The candidate is required to be at the Institute as a full-time student for the coursework (and qualifier examination, if applicable) of his/her Ph.D. Programme. The coursework requirement is likely to be a period of 1-2 semesters. Depending on the student's background and the programme requirements, an additional semester may be needed to complete the coursework/qualifier examination.
4. To promote interaction between the internal supervisor and external co-supervisor, meeting between them should be arranged at least once in a year in the Institute or in the sponsoring organization.
5. The Ph.D. registration of an external candidate would be reviewed at the end of each year from the date of registration in terms of his progress in courses / seminars / approved research programme by a Research Progress Committee (RPC) nominated by the concerned Department Postgraduate Committee (DPGC).
6. At the time of joining the programme, the students will have to produce a "Relieving certificate" from his / her employer that he / she has been fully relieved from normal duties during the semester(s) to complete the course work and other academic work at IIT Dharwad.

Based on the information provided by the applicants a short-list of candidates called for the selection process will be declared on the Institute website on the date specified in the schedule. Only the short-listed candidates are permitted to participate in the selection process.

D. GENERAL GUIDELINES for APPLYING ONLINE

1. Please read all the instructions given in the brochure carefully before filing up the application form.
2. Application fee has to be paid prior filling online application. The transaction details such as Reference No, Transaction Date and Name of the Account Holder have to be mentioned accurately in the application form. **The contact number mentioned in the remarks/comments field of the online payment mechanism has to match with the one which will be entered while filling the application form.** It is also recommended to upload a proof of payment of application fee in pdf format just before submission of the online form.
3. This information brochure and future updates regarding the admission process will be made available on the institute website under section Academics >> Admissions >> PhD.
4. You are required to submit the application form online. There are no downloadable forms available. After filling the form, you are advised to take a print and keep the same for future reference.
5. The application fee is as follows,

Women candidates	₹ 100/-
SC/ST/PwD category candidates	₹ 100/-
All other candidates	₹ 200/-

6. The fee is to be paid by NEFT/RTGS Online Payment System. The details of the institute bank details are:
BANK: State Bank of India
Account Name: REGISTRAR IIT DHARWAD
Account No.: 35636327083
Branch: Main Branch, Dharwad
IFSC: SBIN0000833
7. The transaction details like: UTR/ITR/Transaction Number with date are to be necessarily provided in filling up the Online Application Form. **The Application Form without valid online payment details will not be considered. Application FEE is Non-Refundable.**
8. Applicants may find it convenient to keep following information handy while filling the application form online (whichever relevant): i) Skype Id, ii) passport size photo whose size is less than 50 kb, iii) application fee transaction details of application fee payment e.g. reference no, date of transaction, Name of account holder, phone no used for online payment, iv) Educational details from secondary school onwards, v) GATE qualification details, vi) Statement of Purpose (pdf file), vii) proof of application fee payment (pdf file), viii) list of fellowship/ awards, ix) publications, x) any other achievements/information.
9. Economically Weaker Sections (EWS) candidates may note that the limit of annual income is ₹ 8 lakhs for determining the eligibility for benefit under Economically Weaker Sections (EWS) reservation. The EWS certificate issued by the Competent Authority in the prescribed format must be submitted at the time of admission.
10. Candidates belonging to OBC – NC (Non Creamy layer) as per Government of India norms should produce certificate from competent authority at the time of selection.
11. Check your emails regularly for any updates from the institute regarding the selection process
12. Keep checking institute website regularly for updates regarding the selection process. Shortlisted candidates list will be uploaded on the institute website as per the schedule given above.

Candidates called for written test / interview should bring with them Photo ID Card, Admit Card, Printed Copy of Online Application Form, Photocopies of Academic Transcripts & Experience Certificates, Caste Certificate (if applicable), PwD Certificate (if applicable), EWS Certificate (if applicable), Thesis/Dissertation/Report/Publications and all other relevant documents.

E. GUIDELINES for SHORTLISTED APPLICANTS

E.1 General information

1. Reporting Time: **To be announced later online.**
2. Online screening test will begin on: **To be announced later online.**
3. Based on the performance in the online screening test, some of the candidates will be shortlisted for the written test.
4. Written test will begin on: **To be announced later online.**
5. Based on the performance in the written test, some of the candidates will be shortlisted for the interview.
6. Interviews will be held on: **To be announced later online.**
7. Very limited **accommodation/transportation may be facilitated** in the campus during the written test/interview. Details will be decided later and institute reserves the right to cancel the same at short notice depending upon the future circumstances.
8. Applicants should bring:
 - a. Photo ID card
 - b. Printed copy of the application
 - c. Thesis/dissertation/report of M.Tech. or equivalent degree
 - d. Copy of certificates and mark sheets
 - e. Two passport size photographs
 - f. Scientific calculator
 - g. Copy of publications (if any)

E.2 Examination policy

1. Mobiles are not allowed in the examination hall or during the interview(s).
2. Candidates are responsible for their own belongings during the selection process, especially, the items that you leave outside before entering the examination hall.
3. Candidates are required to bring all documents mentioned in section E for the selection process.
4. Delayed candidates may not be allowed to take the exam after 20 minutes of exam start time and no one will be allowed to leave the exam hall before 30 minutes once exam is started.

F. MODALITY OF THE SELECTION PROCESS

Only the short-listed applicants are permitted to participate in the selection process. The selection process may consist of online screening tests, written tests and/or interviews. Candidates will be offered a PhD position based on their performances as mentioned above.

The selection process consists of two written tests and an interview. The written tests comprise of two stages - First Round and the Second Round, respectively. The interview is the Third Round.

Candidates shortlisted based on the selection criteria are eligible to attend the First Round. Questions will be objective and will be based on the syllabus given in Section G and stream-

specific syllabus given in Section H. Only candidates selected in the First Round are allowed to write the Second Round. No change in stream will be allowed. The Second Round comprises of a subjective/objective test appropriate to their chosen stream in the PhD application form. It will be based on the syllabus given in Section F and stream-specific syllabus given in Section I.

Candidates selected in Second Round are eligible for the Third Round comprising of technical interview. If necessary, an applicant may have to appear before the interview panel more than once. The details of the tests/interview are given in the following sections.

F.1 Details of the first Round

1. There is a 90-minute objective test to all the applicants.
2. Syllabi common for all streams are given in Section G and stream-specific syllabi are given in Section H.
3. A user name and a password is given to you to login and start the exam.
4. No changes will generally be allowed in the choice of field of specialization (stream) once specified in the application form.
5. There is a negative marking for wrong answers.
6. Submit your answers and logout after your examination.
7. After the examination, the applicants are expected to wait till the short-listing for the second round of selection will be announced.
8. Second round of selection follows immediately after the announcement of the result.
9. It is the responsibility of the applicant to note the results of the First and Second round. The results would be displayed at the location/notice board; announced during the test.
10. Results will not be informed to the applicants personally, and no complaints in that regard would be entertained.

F.2 Details of the Second Round

1. The examination contains 90 minutes of subjective/objective paper.
2. Syllabi common for all streams are given in Section G and stream-specific syllabi are given in Section H.
3. All answers should be written in clear hand writing.
4. Assumptions made should be written down clearly.
5. The results will be announced for the third round of selection process on notice board.

F.3 Details of the Third Round of selection

A personal interview is conducted for each applicant who is successful in the Second Round. The applicant is advised to read basics regarding the area of specialization and the topic that he/she has chosen in the application form.

G. RESEARCH TOPICS

The Department of Computer Science and Engineering at IIT Dharwad has expertise in the following domains.

1. **Theoretical Computer Science:** Algorithms, Concurrency, Formal Verification, and Graph Theory.
2. **Embedded systems and Computer Architecture:** Reliability and Security of Hardware, Architectures using Non-Volatile Memories, Modelling and characterization of heterogeneous processors, Power and thermal management of multi-core processors, and Convolutional Neural Network inference on edge devices.
3. **Stream data processing in Distributed Systems,** in particular, Smart Grids, Mining large data streams, In-network query processing
4. **Computer/Communication Networks:** 5G/IoT Networks, AI Driven Networking, Network Virtualization, Network/Cyber Security, Blockchains, Software Defined Networks, Network Function Virtualization, Data Center Networking
5. **Intelligent Systems:** Machine Learning, Reinforcement Learning, Stochastic Control and Optimisation, Bayesian Optimization, Text mining
6. **High Performance Computing:** Parallel Computing, Compilers and Translation Systems, Programming Languages

In this call, applications are invited only for research areas (2)-(6). Only exceptional candidates will be considered for research areas (1). The applicant may be asked to indicate the choice of the research topics in the order of preference.

H. SYLLABUS

For online screening and written test, the following syllabus will be followed. In the online screening, candidates can expect questions based on aptitude and reasoning as well.

- **Discrete Mathematics:** Propositional and first order logic. Sets, relations, functions, partial orders and lattices. Groups. Graphs: connectivity, matching, coloring. Combinatorics: counting, recurrence relations, generating functions, Linear Algebra: Matrices, determinants, system of linear equations, eigenvalues and Eigen vectors, LU decomposition. Calculus: Limits, continuity and differentiability. Maxima and minima. Mean value theorem. Integration. Probability: Random variables. Uniform, normal, exponential, poisson and binomial distributions. Mean, median, mode and standard deviation. Conditional probability and Bayes theorem.
- **Computer Organization and Architecture:** Machine instructions and addressing modes. ALU, data-path and control unit. Instruction pipelining. Memory hierarchy: cache, main memory and secondary storage; I/O interface (interrupt and DMA mode).
- **Programming and Data Structures:** Programming in C. Recursion. Arrays, stacks, queues, linked lists, trees, binary search trees, binary heaps, graphs.
- **Algorithms:** Searching, sorting, hashing. Asymptotic worst case time and space

complexity. Algorithm design techniques: greedy, dynamic programming and divide-and-conquer. Graph search, minimum spanning trees, shortest paths.

- **Theory of Computation:** Regular expressions and finite automata. Context-free grammars and push-down automata. Regular and context-free languages, pumping lemma. Turing machines and undecidability.
- **Compiler Design:** Lexical analysis, parsing, syntax-directed translation. Runtime environments. Intermediate code generation.
- **Operating System:** Processes, threads, inter-process communication, concurrency and synchronization. Deadlock. CPU scheduling. Memory management and virtual memory. File systems.
- **Computer Networks:** Concept of layering. LAN technologies (Ethernet). Flow and error control techniques, switching. IPv4/IPv6, routers and routing algorithms (distance vector, link state). TCP/UDP and sockets, congestion control. Application layer protocols (DNS, SMTP, POP, FTP, HTTP). Basics of Wi-Fi. Network security: authentication, basics of public key and private key cryptography, digital signatures and certificates, firewalls.

I. INFORMATION PERTAINING TO HOSTELS

About IIT Dharwad	Kindly visit the website https://www.iitdh.ac.in/ for available facilities
Hostel Room Allocation	You will be given your room key at the time of registration. Each room accommodates approximately four students and has an attached bath & toilet.
Are hostel rooms furnished	Each student is given a cot, chair, table and wardrobe. Students can purchase mattress/bedding, bucket etc. locally.
Possession of motorized vehicle	NOT ALLOWED, however bicycle is permitted in the campus.
Climatic conditions	Generally, it will be raining, windy & cold. It is suggested that you carry protective clothing accordingly.

J. FEES, DEPOSITS & HOSTEL RENT

S. No	Amount (INR)	Amount (in INR) for General/OBC/EWS	Amount (in INR) for For SC/ST/PwD
A. One-time payment at the time of admission			
1	Admission fee	2,200.00	2,200.00
2	Thesis fee	2500.00	2500.00
3	Medical examination	400.00	400.00
4	Provisional certificate	500.00	500.00
5	Student welfare fund	1,000.00	1,000.00
6	Modernisation & upgradation	2500.00	2500.00
7	Identity card	500.00	500.00
	Sub-total (A)	9,600.00	9,600.00
B. Per semester fee			
1	*Tuition Fee-Statutory fee	2500.00	00.00
2	Examination fee	1,000.00	1,000.00
3	Registration fee	750.00	750.00
4	Gymkhana fee	1,750.00	1,750.00
5	Student benevolent fund	500.00	500.00
6	Medical fee	1,500.00	1,500.00
7	Hostel rent	2,000.00	2,000.00
8	Electricity & water charges	3,000.00	3,000.00
9	Hostel establishment charges	3,000.00	3,000.00
10	Mess establishment charges	1,550.00	1,550.00
11	Student association insurance fund	200.00	200.00
	Sub-total (B)	17,750.00	15,250.00
C. Deposits (refundable) to be paid at the time of admission			
1	Institute security deposit	1,000.00	1,000.00
2	Library security deposit	1,000.00	1,000.00
3	Mess security deposit	1,000.00	1,000.00
	Sub-total (C)	3,000.00	3000.00
GRAND TOTAL FEE (A+B+C)		30,350.00	27,850.00

NOTE:

1. All the students are required to submit the **Mess Advance of ₹ 26,000.00/-** per semester by online payment method along with the course fee.
2. * Students admitted under External category (EX) will pay tuition-statutory fee of ₹ 25,000/- per semester (**Grand total fee of ₹52,850/-**). It shall be noted institute will incur semester continuation fee of ₹ 5000/- when a candidate joins parent organization after finishing the required course work at IIT Dharwad.
3. * IIT Dharwad reserves the right to revise the tuition fee-statutory fee.

Appendix A: Sponsorship Certificate for Ph.D. External Registration (EX)

(To be typed on letterhead of the Sponsoring Organization)

Name of the applicant:

Name of the sponsoring organization:

Address:

Present Designation of the applicant:

Present status of the applicant: (Permanent/Semi-permanent/Temporary)

Division where research work is proposed to be done:

Name of supervisor from the sponsoring organization:

(Bio-data of supervisor to be enclosed giving details of designation, qualification, research experience etc.)

Details of facilities relevant to the research problem which will be made available to the candidate by the organization.

Statement of proposed Co-supervisor (external)

If Shri / Kum. / Smt. _____

is registered for the doctorate degree, I, _____

, agree to act as his/ her research Co-supervisor along with the research Supervisor from IIT Dharwad.

Date:

Signature of proposed Co-supervisor (external)

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Statement of sponsoring authority

If Shri. /Kum. / Smt. _____

is admitted to the Ph.D. programme, we shall allow him/ her to undergo the programme of studies at IIT Dharwad.

Further, we shall fully relieve him/her from normal duties to complete the course work requirement (and qualifier examination, if applicable) at IIT Dharwad.

During the period of Doctoral programme, the candidate will be permitted to carry out his / her research work at our laboratories / organization and will be given the required facilities.

We also give our consent to Shri. /Kum. / Smt./ Dr. _____

of our organization to be the Co-supervisor (external) of the Ph.D. thesis, along with a faculty member of IIT Dharwad as the Supervisor.

Date:

Signature and Seal of the Sponsoring Authority

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